DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 3 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 3 recites that the tip end portion of the needle has a "quadratic surface shape." It is not clear to the Examiner what a "quadratic surface shape" is and there is no disclosure in the specification indicating the structure of a quadratic-surface-shaped end portion of a needle.

For compact prosecution purposes, all the Figures illustrating the needle tip (Figures 2, 3A, 3B, 4A and 4B) of the present application show a needle tip which is conical in shape. As such, a “quadratic surface shape” will be treated as the cone-like structure.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claim 5 is rejected under 35 U.S.C. 102(b) as being anticipated by Sahoda et al. (US Patent Application 2002/0022172).

Regarding claim 5, Sahoda discloses a fluid supply device for a fuel cell with an ejector 30 comprising a nozzle 32 for ejecting fluid, a needle 33 which is disposed coaxially with the nozzle 32 (abstract) and has a tip end portion 50 in the form of a paraboloid which faces said nozzle 32 (see Figures 2, 4 and 8 and paragraphs 62-70). Movable drive shaft 45 and drive section 34, among other components, comprise "needle moving means" which cause the needle to advance and retreat axially (paragraphs 19 and 66). "Needle moving means" is also described as a needle position adjustment advice which shifts the needle along its axial direction (paragraph 19).

Claim Rejections - 35 USC § 102/103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7 Claims 1-4 and 8 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Sahoda et al. (US Patent Application 2002/0022172).

Regarding claim 1, Sahoda discloses a fluid supply device for a fuel cell with an ejector 30 comprising a nozzle 32 for ejecting fluid, a needle 33 which is disposed coaxially with the nozzle 32 (abstract) and has a tip end portion 50 which faces said nozzle 32 (see Figure 2 and paragraphs 62-70). Movable drive shaft 45 and drive section 34, among other components, comprise "needle moving means" which cause the needle to advance and retreat axially (paragraphs 19 and 66).

Sahoda discloses that there is a needle position adjustment device (i.e., the "needle moving means" aforementioned) which shifts the needle along its axial direction and a taper section position adjustment device which shifts the taper section along its axial direction wherein there is a first fluid flow which passes through a first fluid conduit which is constituted by a gap between the needle and the aperture portion of the nozzle (paragraph 19). Sahoda further discloses that the shape of the needle may be determined so that the stoichiometry value for the fluid conduits has been set in advance in correspondence with flow (paragraph 22). By utilizing this type of structure it is possible to vary the ratio of the flows in the conduits continuously to the desired flow ratio, and accordingly it is possible to obtain the desired stoichiometry value by changing the position and shape of the needle (paragraphs 22 and 23).

Thus, as evidenced by paragraphs 22 and 23, the shape of the tip of the needle is set such that an opening area of a gap between the end portion of the needle and the nozzle and the amount of the movement produced by said needle ensure the necessary flow of fuel to the fuel

cell while ensuring the stoichiometry characteristic over a wide range of fuel flow from a low flow to a high flow (paragraph 76).

Therefore, it is the position of the Examiner that as the same structure as claimed by the Applicant's, along with a nearly identical inventive concept, is disclosed by Sahoda, that the relationship between gap formed between the needle and nozzle and the amount of movement produced by said needle would satisfy a proportional relationship. A reference which is silent about a claimed invention's features is inherently anticipatory if the missing feature is necessarily present in that which is described in the reference. Inherency is not established by probabilities or possibilities. *In re Robertson*, 49 USPQ2d 1949 (1999).

In the alternative, it would have been obvious to one of ordinary skill in the optimize the relationship between the position, shape and movement of the nozzle because Sahoda discloses that the shape of the tip of the needle is set such that an opening area of a gap between the end portion of the needle and the nozzle and the amount of the movement produced by said needle ensure the necessary flow of fuel to the fuel cell while ensuring the stoichiometry characteristic over a wide range of fuel flow from a low flow to a high flow (paragraph 76). In other words, the desired flow of fluid can be obtained by altering the position, shape and movement of the needle (see paragraphs 19, 22, 23 and 76). The discovery of an optimum value of a known result effective variable, without producing any new or unexpected results, is within the ambit of a person of ordinary skill in the art. See *In re Boesch*, 205 USPQ 215 (CCPA 1980) (see MPEP § 2144.05, II.).

Regarding claim 2, the tip end portion of the needle 33 is illustrated as being conical in shape as illustrated in Figure 2 and 4, and further by first taper section 51 of needle 33 in Figure 8.

Regarding claim 3, Sahoda discloses a conical structure for the shape of the needle (see Figures 2 and 4 and first taper section 51 of needle 33 in Figure 8). As aforementioned, a "quadratic surface shape" is interpreted as a conical-like structure based on the Applicant's drawings (see the 112, second paragraph rejection).

In the alternative, it would have been obvious to one of ordinary skill in the art to modify the shape of the needle as Sahoda teaches that the shape of the needle may be determined so that the stoichiometry value for the fluid conduits matches a stochiometry value which has been set in advance in correspondence to flow (paragraph 22).

Regarding claim 4, Sahoda discloses that there is a needle position adjustment device (i.e., the "needle moving means" aforementioned) which shifts the needle along its axial direction and a taper section position adjustment device which shifts the taper section along its axial direction wherein there is a first fluid flow which passes through a first fluid conduit which is constituted by a gap between the needle and the aperture portion of the nozzle (paragraph 19). Sahoda further discloses that the shape of the needle may be determined so that the stoichiometry value for the fluid conduits has been set in advance in correspondence with flow (paragraph 22). By utilizing this type of structure it is possible to vary the ratio of the flows in the conduits continuously to the desired flow ratio, and accordingly it is possible to obtain the desired stoichiometry value by changing the position and shape of the needle (paragraphs 22 and 23).

Therefore, it is the position of the Examiner that as the same structure as claimed by the Applicant's, along with a nearly identical inventive concept, is disclosed by Sahoda, that the equation claimed in claim 4 would inherently be satisfied. A reference which is silent about a claimed invention's features is inherently anticipatory if the missing feature is necessarily present in that which is described in the reference. Inherency is not established by probabilities or possibilities. *In re Robertson*, 49 USPQ2d 1949 (1999).

In the alternative, it would have been obvious to one of ordinary skill in the optimize the relationship between the position, shape and movement of the nozzle because Sahoda discloses that the shape of the tip of the needle is set such that an opening area of a gap between the end portion of the needle and the nozzle and the amount of the movement produced by said needle ensure the necessary flow of fuel to the fuel cell while ensuring the stoichiometry characteristic over a wide range of fuel flow from a low flow to a high flow (paragraph 76). In other words, the desired flow of fluid can be obtained by altering the position, shape and movement of the needle (see paragraphs 19, 22, 23 and 76). The discovery of an optimum value of a known result effective variable, without producing any new or unexpected results, is within the ambit of a person of ordinary skill in the art. See *In re Boesch*, 205 USPQ 215 (CCPA 1980) (see MPEP § 2144.05, II.).

Regarding claim 8, Sahoda discloses that the ejector 30 is to be used as a fluid supply device which is used in a supply system for fuel to a fuel cell (paragraph 2). The fuel cell system illustrated in Figure 1 includes a fuel cell 11 with the ejector 30 being incorporated into the piping of the system as the ejector is provided in a flow conduit which connects the pressure control section 18 and the moisturizing section 13 (see paragraphs 53-61). Exhaust fuel ("fluid

discharged from the fuel cell") is exhausted from the fuel cell 11 and is supplied via a non-return valve 23 to a hydrogen recirculation inlet 36 of the ejector 30. The ejector 30 mixes fuel ("new fluid") which has been supplied from the fuel supply side pressure control section 18 with the exhuast fuel ("fluid discharged from the fuel cell") which has been exhausted from the fuel cell 11 and supplies the resulting mixture to the fuel cells 11(paragraph 60).

Claim Rejections - 35 USC § 103

8. Claims 6 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sahoda et al. (US Patent Application 2002/0022172) as applied to claims 1-4 and 8 above, and further in view of Sugawara et al. (US Patent Application 2002/0106547).

Regarding claim 6, Sahoda discloses that the needle position adjustment device ("needle moving means") comprises a drive section 34 comprising a linear drive type step motor ("biasing member") and a movable drive shaft 45 ("piston") which has the base end of needle 33 fixed upon the end of the movable shaft ("piston") (paragraph 66). The movable drive shaft 45 ("piston") is illustrated in Figure 2 as having a front and rear surface to which hydrogen ("fluid") is led via the hydrogen recirculation inlet and/or the hydrogen inlet and gap between the nozzle and the needle (see Figure 2). The drive section 34 ("biasing member") biases the entire movable drive shaft 45 ("piston") including the front and rear surfaces toward the tip end portion of the needle 33 when the amount of fuel required by the anode of the fuel cell is low, allowing little to no fuel to be supplied to the anode.

The needle position adjustment device shifts the needle along its axial direction (either "advancing" or "retreating") by the drive section (abstract) and is controlled in a predetermined manner based upon the output current of the fuel cell 11 (paragraph 93).

Thus, Sahoda discloses all the elements claimed in claim 6 expect that the needle advances and retreats on the basis of a balance between a differential fluid pressure on said piston and a biasing force of said biasing member. Sugawara discloses analogous art of a variable flow-rate ejector and a fuel cell system having same. Sugawara discloses all the similar parts of the ejector as disclosed by Sahoda: a nozzle for ejecting a first fluid, a needle inserted into the nozzle wherein the central axis of the needle coincides with that of the nozzle and which as a tip portion facing said nozzle, and a diffuser (paragraphs 13-18). Furthermore, the disclosure of Sugawara is aimed at the same concept of Sahoda: the area of an opening around the needle in the opening at the head of the noozle is changed by displacement of the needle along the central axis which controls the flow rate of the fuel (abstract).

Specifically, Sugawara teaches a first diaphragm 35 ("piston") connected to an end portion of needle 33 which includes a front and a rear surface to which a fluid is led (the fluid is led via fuel supply passage 53 to fluid passage 51 where the rear surface of the first diaphragm 35 is located) (paragraphs 53-67; see also Figure 2). A second diaphragm 36 ("biasing member") which biases the rear surface of the first diaphragm 35 ("piston") towards the tip of needle 33 as second diaphragm 36 ("biasing member") has pressure applied on its left side by the fuel electrode pressure supply passage 57 (paragraph 67). Sugawara discloses that the displacement of the needle along the central axis is caused by the movement of the first and second diaphragms which move in accordance with the pressure produced by the fluids

(abstract). The pressure ΔP2 applied to the second diaphragm 36 is obtained by subtracting the air pressure Pair at the air electrode of the fuel cell from the fuel pressure at the fuel electrode of the fuel cell, that is, ΔP2 indicates the differential pressure between the two electrodes of the fuel cell 21 (paragraph 68). Thus, Sugawara discloses that the needle advances and retreats on the basis of a balance between differential fluid pressure on the first diaphragm 35 ("piston") and the biasing force of the second diaphragm 36 ("biasing member"). Sugawara notes that according to this structure, "…a specific necessary differential pressure between the fuel and air electrodes can be precisely controlled [and] therefore, the flow rate of the fuel supplied to the fuel cell 21 can be suitably controlled only by employing a specific mechanical control and without employing electrical control. Consequently, it is possible to avoid complication of the system 20, and to decrease the costs necessary for constructing a reliable system" (paragraph 79).

Therefore, it would have been obvious to one of ordinary skill in the art to modify the ejector of Sahoda such that the needle advances and retreats on the basis of a balance of a differential fluid pressure on a piston and a biasing force of a biasing member as taught by Sugawara because Sugawara teaches that this allows for the differential pressure to be precisely controlled allowing for the flow rate of the fuel supplied to the fuel cell to be suitably controlled which in turn avoids complication of the system and decreases the costs necessary for constructing a reliable system (paragraphs 68 and 79).

Regarding claim 7, modified Sahoda discloses that the fluid which is led to the rear surface of the first diaphragm ("piston") is the fuel supplied via fuel supply passage 53 which is then ejected through the nozzle 32 (Sugawara – see Figure 2 and paragraphs 53-65).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to AMANDA BARROW whose telephone number is (571)270-7867. The examiner can normally be reached on 7:30am-5pm EST. Monday-Friday, alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dah-Wei Yuan can be reached on 571-272-1295. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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